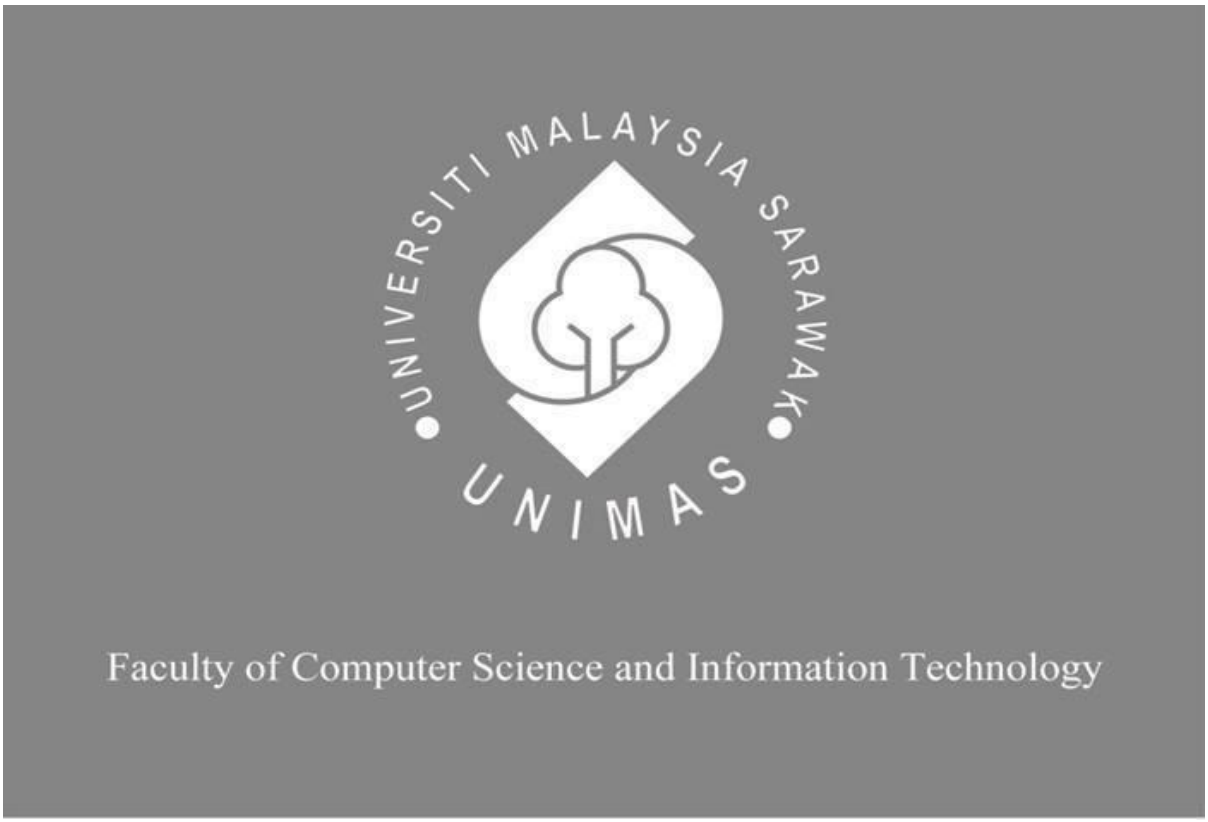


***Intelligent Queue Management System (i-Queue) for Patients in Hospital***

Lee Kai Li

Bachelor of Computer Science with Honours

(Multimedia Computing)

2020

**UNIVERSITI MALAYSIA SARAWAK**

**THESIS STATUS ENDORSEMENT FORM**

**TITLE** INTELLIGENT QUEUE MANAGEMENT SYSTEM (i-QUEUE) FOR PATIENTS IN HOSPITAL

**ACADEMIC SESSION:** 2019/2020

**(CAPITAL LETTERS)**

hereby agree that this Thesis* shall be kept at the Centre for Academic Information Services, Universiti Malaysia Sarawak, subject to the following terms and conditions:

1. The Thesis is solely owned by Universiti Malaysia Sarawak
2. The Centre for Academic Information Services is given full rights to produce copies for educational purposes only
3. The Centre for Academic Information Services is given full rights to do digitization in order to develop local content database
4. The Centre for Academic Information Services is given full rights to produce copies of this Thesis as part of its exchange item program between Higher Learning Institutions [ or for the purpose of interlibrary loan between HLI ]
5. ** Please tick ( √ )

| | | |
|---|---|---|
| ☐ | CONFIDENTIAL | (Contains classified information bounded by the OFFICIAL SECRETS ACT 1972) |
| ☐ | RESTRICTED | (Contains restricted information as dictated by the body or organization where the research was conducted) |
| ☑ | UNRESTRICTED | |

Validated by

(AUTHOR'S SIGNATURE)

(SUPERVISOR'S SIGNATURE)

Permanent Address

10, LRG AMAN JAYA 4, TMN
AMAN JAYA 14000 BUKIT
MERTAJAM, PULAU PINANG.

Date: 11/8/2020

Date: 11/8/2020

Note * Thesis refers to PhD, Master, and Bachelor Degree
** For Confidential or Restricted materials, please attach relevant documents from relevant organizations / authorities

# INTELLIGENT QUEUE MANAGEMENT SYSTEM (i-QUEUE) FOR PATIENTS IN HOSPITAL

LEE KAI LI

This project is submitted in partial fulfilment of the
requirements for the degree of
Bachelor of Computer Science with Honours

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK
2020

# SISTEM PENGURUSAN QUEUE INTELIGEN (i-QUEUE) UNTUK PESAKIT-PESAKIT DI HOSPITAL

LEE KAI LI

Projek ini merupakan salah satu keperluan untuk Ijazah

Sarjana Muda Sains Komputer dan Teknologi Maklumat

Fakulti Sains Komputer dan Teknologi Maklumat

UNIVERSITI MALAYSIA SARAWAK

2020

## DECLARATION

I hereby declare that the work entitled Intelligent Queue Management System (i-Queue) For Patients in Hospital submitted to the Faculty of Computer Science and Information Technology (FCSIT) is my original work under the guidance of my supervisor, Dr. Chai Soo See.

Lee Kai Li 14/07/2020

## ACKNOWLEDGMENT

I would like to express my deepest gratitude to those who have guided me throughout this project development. Firstly, special thanks to my supervisor Dr. Chai Soo See, who has provided continuous guidance and support to complete this project. Besides, I would like to thank my examiner, Mdm. Inson who guided and provided advice throughout the development of the proposed system. I also wish to thank my family who gives me mentally support throughout the completing of this project. I also would like to thank my friends who provided some suggestions in assisting this project.

## Table of Contents

## List of Figures

## List of Tables

## List of Abbreviations

| | |
|---|---|
| FYP | Final Year Project |
| UNIMAS | Universiti Malaysia Sarawak |
| FCFS | First Come First Serve |
| F & B | Food and Beverage |
| IDE | Integrated Development Environment |
| RAM | Random Access Memory |
| JDK | Java Development Kit |
| DFD | Data Flow Diagram |
| ERD | Entity Relationship Diagram |

## ABSTRACT

*Queuing is a major challenge in the medical care industry. A proper queue management system can help to optimize the queue length, average waiting period, and the usage of the medical cares' resources. Therefore, this project aims to design an Android mobile application which is to manage patients' queues between patients and staffs in an effective way. The proposed system provides a portable platform to solve the current queueing system. Patients are able to join the queue virtually anywhere. At the same time, they able to monitor the queue status and a receive virtual ticket. Patients also able to notify when they are ready to be served.*

## ABSTRAK

Beratur adalah cabaran utama dalam industri penjagaan perubatan. Sistem pengurusan baris gilir yang betul dapat membantu mengoptimumkan panjang giliran, tempoh menunggu purata, dan penggunaan sumber-sumber penjagaan medik. Oleh itu, projek ini bertujuan untuk merekabentuk aplikasi Android yang menguruskan antrian pesakit antara pesakit dan kakitangan dengan cara yang berkesan. Sistem yang dicadangkan menyediakan platform yang mudah alih untuk menyelesaikan sistem antrian semasa. Pesakit boleh menyertai barisan di mana sahaja. Pada masa yang sama, mereka dapat memantau status barisan dan menerima tiket maya. Pesakit juga dapat memberitahu apabila mereka bersedia untuk disampaikan.

# CHAPTER 1: INTRODUCTION

## 1.1 Project Title

Intelligent Queue Management System (i-Queue) for Patients in Hospital.

## 1.2 Introduction

The Intelligent Queue Management System (i-Queue) for patients in hospital is a mobile application platform between patients and staff to manage patients' queues in a customized way. The Intelligent Queue Management System (i-Queue) for patients will carry out at Sarawak General Hospital. Sarawak General Hospital is a government hospital. Government hospital also can knowns as a public hospital. Government hospital provides medical care with minimum charges or free of charge and other public service facilities to support poor or middle classes of patients. Thus, it is always overcrowded. Long queues will cause frustration and irritation among the staff and patients. Through the mobile application, patients could register online and join the queue virtually. Because patients could access the mobile application anywhere where there is an internet connection provided. Besides, patients could get real-time queue status information through the mobile application so patients can spend their time wisely during the queuing period. In addition, walk-in patients could use the on-site numbering device to join the queue. Moreover, there are special counters provided for walk-in patients with emergency cases or senior citizens could go to the special counters. Furthermore, there are on-screen monitors provided to display and call the queue number. The staffs could monitor the queue status. Additionally, the staff obtains the real-time analytics of the queue data. Therefore, patients can receive the right care in a short time meanwhile the workload of staff can be reduced.

## 1.3 Problem Statement

There are some problems that are investigated as follows:

i. The hospital operations slow down due to the current manual queuing system.
ii. The patients' queuing period is too long.
iii. The hospital staffs' workload increased due to weaknesses in the current manual queuing system used.
iv. The manual queue management system is according to the algorithm first come first serve (FCFS), patients must register themselves physically and early.

## 1.4 Scope

The proposed system is to allow patients to register online and join the queue virtually. So, the target users are patients and staff. However, this mobile application only available to Android users. This proposed system carries out based on the hospital's working hours from 8 am till 5 pm. Next, the proposed system allows the targeted users access within the internet connection.

## 1.5 Aims and Objectives

The main objective of this project is to manage patients' queues in a customized way between patients and staffs. Others objectives included:

i. To design a mobile application to allow patients to register online and join the queue virtually.
ii. To increase the effectiveness and efficiency of hospital operations throughout the mobile application.
iii. To investigate the usability and flexibility of the proposed system.

## 1.6 Brief Methodology

The methodology used depends on the type of projects, complexity and schedule availability. For Intelligent Queue Management System (i-Queue) project, Agile Methodology is chosen as the methodology to ensure the process of system development is successful. Agile Methodology is a process that consists of continuous iteration of development and testing (Guru99, n.d.). By using this method, the unpredictable problems of the project can be solved and handled through iterative work and feedback. Furthermore, agile methodology delivers high quality and rapid development than the traditional methodologies like Waterfall. Besides, the agile methodology allows changes and fixes errors during the process of system development. The agile methodology model is illustrated in Figure 1.1.

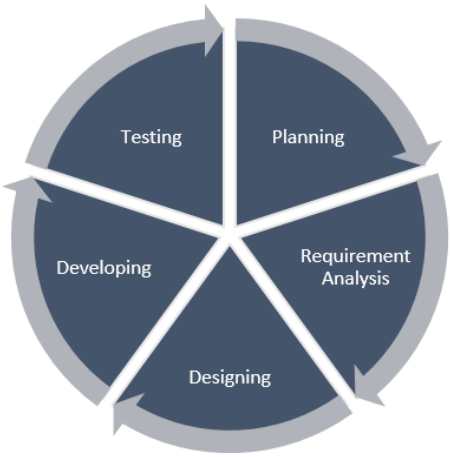


*Figure 1.1:Agile Methodology*

There are five phases in the agile methodology. Firstly, the planning phase is the initiation of the project for quality assurance. The title, objectives, problem statements, and other project descriptions are determined in this phase. The project descriptions are approved by the final year project supervisor and examiner at the end of this phase. Next, requirement analysis is an important phase because it is to determine the targeted users' expectations by using different techniques like

Entity Relationship Diagram (ER Diagram), Use Case, Data Flow Diagram (DFD), etc. Before starting to develop a new system, a prototype is required to develop according to the project requirements. The prototype designed to visualize user interface easily. This project involves the Android Studio and Java JDK installation to develop the final product based on the final version prototype. The last phase is testing. Once the final product is developed, internal testing and modification are performed before to let targeted users test. After completing the internal testing, the final product would evaluate and test by target users. This phase will undergo routinely until the final product is satisfied.

## 1.7 Significance of Project

The Intelligent Queue Management System (i-Queue) for patients in hospital would solve the problems of the current manual queuing system. The significance of the project is to manage patients' queues in a customized way by allowing the patients to register online and join the queue virtually. Apart from that, patients able to get queue status information to minimize the waiting period throughout the mobile application. The staffs also able to obtains real-time analytics of queue data like the total number of patients of the hospital in a day.

## 1.8 Project Schedule

A project schedule is important to ensure the process of system development is successful. It is used as a guideline to identify the milestone of the project to encourage the project can be completed on time. This project will take two semesters to complete. Gantt Chart is the selected tool used for scheduling the progress of the project. Figure 1.2 and 1.3 represents the Gantt Chart for semester one of this project.

| | Task Mode | Task Name | Duration | Start | Finish |
|---|---|---|---|---|---|
| 1 | | **1 Intelligent Queue Management System (i-Queue) for Patients in Hospital** | **183 days** | **Wed 18-09-19** | **Fri 29-05-20** |
| 2 | | **1.1 Final Year Project 1 (FYP 1)** | **84 days** | **Wed 18-09-19** | **Sat 11-01-20** |
| 3 | | 1.1.1 Identify Project Title | 1 day | Wed 18-09-19 | Wed 18-09-19 |
| 4 | | 1.1.2 Prepare Brief Project Description | 6 days | Fri 20-09-19 | Fri 27-09-19 |
| 5 | | 1.1.3 Prepare Full Project Proposal | 10 days | Mon 30-09-19 | Fri 11-10-19 |
| 6 | | 1.1.4 Prepare Chapter 1 - Introduction | 10 days | Mon 14-10-19 | Fri 25-10-19 |
| 7 | | 1.1.5 Prepare Chapter 2 - Background Study/ Literature Review | 16 days | Sun 27-10-19 | Fri 15-11-19 |
| 8 | | 1.1.6 Prepare Chapter 3 - Methodology | 15 days | Sun 17-11-19 | Thu 05-12-19 |
| 9 | | 1.1.7 Submit Final Year Project 1 Report | 5 days | Fri 06-12-19 | Thu 12-12-19 |
| 10 | | 1.1.8 Final Year Project 1 Symposium | 2 days | Tue 17-12-19 | Wed 18-12-19 |
| 11 | | 1.1.9 Final Year Project 1 Report Admendment | 6 days | Thu 19-12-19 | Thu 26-12-19 |
| 12 | | 1.1.10 Submit FYP 1 Final Report and Project | 3 days | Wed 08-01-20 | Fri 10-01-20 |
| 13 | | **1.2 Milestone: Final Year Project 1 completed** | **0 days** | **Sat 11-01-20** | **Sat 11-01-20** |
| 14 | | **1.3 Final Year Project 2** | **100 days** | **Mon 13-01-20** | **Fri 29-05-20** |
| 15 | | 1.3.1 Prepare Chapter 4 - Implementation | 51 days | Mon 13-01-20 | Mon 23-03-20 |
| 16 | | 1.3.2 Prepare Chapter 5 - Testing | 10 days | Tue 24-03-20 | Mon 06-04-20 |
| 17 | | 1.3.3 Prepare Chapter 6 - Conclusion and Future Work | 10 days | Tue 24-03-20 | Mon 06-04-20 |
| 18 | | 1.3.4 Submit Final Year Project 2 Report | 7 days | Tue 07-04-20 | Wed 15-04-20 |
| 19 | | 1.3.5 Final Year Project 2 Symposium | 2 days | Tue 05-05-20 | Wed 06-05-20 |
| 20 | | 1.3.6 Final Year Project 2 Admendment | 13 days | Thu 07-05-20 | Sat 23-05-20 |
| 21 | | 1.3.7 Submit FYP 2 Final Report and Project | 6 days | Sun 24-05-20 | Fri 29-05-20 |
| 22 | | **1.4 Milestone: Final Year Project completed** | **0 days** | **Fri 29-05-20** | **Fri 29-05-20** |

*Figure 1.2: Gantt Chart*

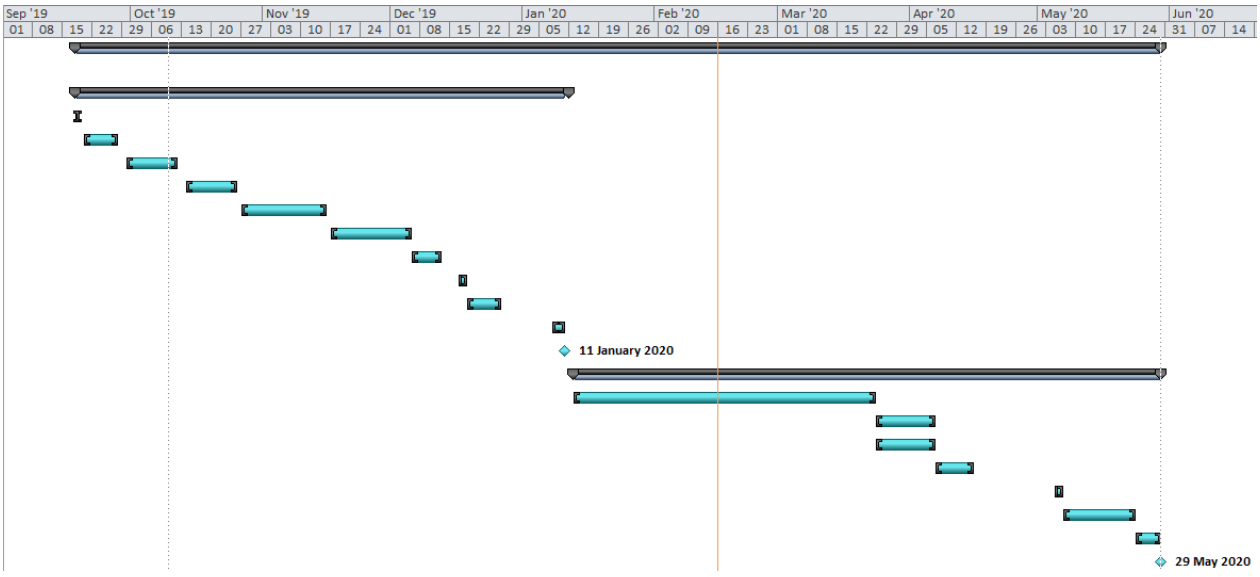


*Figure 1.3: Gantt Chart.*

## 1.9 Expected Outcome

A mobile application in terms of the Intelligent Queue Management System (i-Queue) for patients in hospital is developed. Throughout the mobile application, patients able to register online and join the queue virtually. Thus, the mobile application provides great flexibility and optimally elevates patients' satisfaction. Besides, patients also able to get real-time queue status information by using the mobile application so patients can spend their time wisely during the queuing period.

## 1.10 Project Outline

This project consists of these following chapters:

### 1.10.1 Chapter 1: Introduction

Chapter 1 describes the introduction of the project. This chapter includes the problem statement, objectives, scope, brief methodology, significant of project, project schedule and expected outcome of the project. The problem statement defines the existing system problem faces. The objectives act as the project's goal to achieve at the end of the development. The scope states the range to be covered for this project.

### 1.10.2 Chapter 2: Literature Review

This chapter discusses the literature review on the existing and related similar systems. There are three existing queue management system based on mobile applications will be downloaded for reviewing purpose. Based on online articles, journals, e-book, and conference papers, the comparison between the selected mobile application will be analyzed.

### 1.10.3 Chapter 3: Requirement Analysis and Design

This chapter will further explain the methodology used to develop the project. Besides, this chapter also involves the requirement analysis where the user and system requirements are fully clarified. A prototype will be designed for the proposed system in this chapter.

### 1.10.4 Chapter 4: Implementation

Chapter 4 focuses on the implementation of the proposed system. By using Android Studio and Firebase to implement the coding part of the proposed system.

### 1.10.5 Chapter 5: Testing

Testing will be done in this chapter to ensure this project meets the user and system requirements. Furthermore, errors and changes will be fixed before submission.

### 1.10.6 Chapter 6: Conclusion and Future Works

Chapter 6 is the last chapter of the project to conclude the project and identify the project successes and failures. The project limitation and further improvement in the future work will be stated to boost the quality of the proposed system.